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Abstract

The distributional impact of Value Added Tax (VAT) or Goods and Services Tax (GST) has long been a topic of research in public finance. A progressive tax system helps the government mobilise revenue without impacting inequality. Based on the National Sample Survey Office's Household Consumption Expenditure Survey of 2022-23, we assess the distributional impact of Indian GST separately for rural and urban areas across fractile classes of average monthly per capita consumption expenditure. The results indicate that the Indian GST is progressive, as measured by various indices of progressivity, including the Progressive Vertical Index, the Kakwani Index of Progressivity, the Reynolds-Smolensky Index, and the Musgrave-Thin Index. The bottom 50% and the middle 30% of consumers bear 31% each, while the top 20% bear 37% of the tax burden in rural areas. In urban areas, the bottom 50% of consumers bear 29%, the middle 30% bear 30%, and the top 20% bear 41% of the tax burden. Any change in the GST rate structure may have distributional implications depending on the consumption patterns of consumers across different GST rate categories. The redistributive effect of Indian GST is positive, as post-tax consumption inequality decreases.

Key Words: Distributional Impacts, Tax Incidence, Tax Progressivity, Consumption Inequality, Goods and Services Tax (GST), Effective Tax Rate, India.
JEL Codes: H22, D30, E21, D63

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1. Introduction

While Value Added Tax (VAT) (or Goods and Services Tax, GST) has been widely adopted due to its simplicity and effectiveness as a revenue raiser, it also presents its own equity and incidence challenges. Equity concerns are more inclined towards the distributional impact of VAT as it is generally regressive and disproportionately affects low-income households (Thomas, 2020). The literature evaluating the regressive or progressive nature of VAT is divided into two groups: one that suggests VAT is highly regressive, and the other that argues VAT is relatively proportional or moderately progressive. Studies which measure the burden of VAT as a percentage of current income across the income distribution usually conclude that VAT is highly regressive (Leahy et al., 2011; O'Donoghue et al., 2004).[1] However, in the context of 27 OECD countries, Thomas (2020) found that VAT is roughly proportional or moderately progressive, with reduced VAT rates and VAT exemptions driving progressivity.

The incidence of VAT depends on how much businesses can pass on the tax burden to consumers. The effective incidence of VAT is determined not by the formal nature of VAT, but by market circumstances, which include the price elasticity of demand for consumption and the nature of competition between suppliers (Ebrill et al., 2001). In competitive markets where businesses have lower control over prices, they might absorb a portion of the VAT burden by reducing prices. In less competitive markets with inelastic demand, businesses might have greater power or ability to shift the tax burden on consumers through higher prices (Delipalla & Keen, 1998).

To assess the distributional effects of the VAT, most studies have used cross-sectional household-level consumption expenditures to measure average VAT rates as a percentage of either total expenditure or household income (Thomas, 2020). Some studies have measured the burden of VAT as a percentage of current income across the income distribution of households (i.e., income-based approach) and found the regressive nature of VAT (Blasco et al., 2023; OECD/KIPF, 2014; Gaarder, 2019). In contrast, other studies examine the VAT burden as a proportion of current expenditure across the expenditure distribution of households (i.e., an expenditure-based approach) and find that VAT is relatively proportional or moderately progressive (Bird & Smart, 2016; IFS, 2011; Metcalf, 1994). Therefore, the distributional impact of VAT varies across methodologies and countries (or groups of countries) depending on the design and structure of the VAT system.

In the Indian GST regime, harmonising tax rates facilitates the assignment of item-wise GST rates for commodities covered in the National Sample Survey Office's (NSSO) Household Consumption Expenditure Survey (HCES) of 2022-23. Literature on the distributional impact of the Indian GST is sparse. Mukherjee (2024) assessed it based on the CMIE's Consumer

[1] "The degree of VAT's regressivity has a direct correlation with the saving ratio, i.e., a VAT is regressive to the extent that the saving ratio increases with income. Where t is the tax rate, this is demonstrated by the following equation: t(C/Y)=t[1-(S/Y)]." van Brederode (2021, P. 83). Explanation: C=(Y-S), tC/Y = t[(Y-S)/Y) =t[1-(S/Y)]

Pyramids Households Survey (CPHS) data of 2021-22. However, the number of samples (1,63,204 households, comprising 33.5% rural and 66.5% urban) and the coverage of items (123) are limited in the CMIE's CPHS database compared to the NSSO's HCES 2022-23. The NSSO's HCES 2022-23 covers 2,61,746 households (59% rural and 41% urban) and 390 consumption items (Table 1). The large number of items makes it relatively easier to assign GST rates, and therefore, better results are expected. This survey does not capture the income of households, which restricts our ability to assess the distributional impact of the GST using an income-based approach.

One of the key challenges associated with VAT is the presence of multiple tax rates, exemptions, and divergences in accounting bases and rules across different industries and firms. Applying multiple rates to different goods and services complicates businesses and tax authorities. Diversity in tax rates makes it challenging for businesses to accurately determine and apply the correct tax rate for each transaction. Classifying goods under different tax categories requires a detailed understanding of the tax code, which may lead to errors and misclassifications. The larger the scope of goods and services subject to concessional rates or exemptions, the more likely categorisation problems are, and hence the greater the compliance burden (Highfield et al., 2019).

The rationale for a single-rate VAT is its simplicity, which avoids the numerous technical problems associated with multiple rates and, consequently, the inefficiencies resulting from increased compliance complexity.[2] A single rate also does not distort consumer choices, as relative market prices remain unchanged and the allocation of factor inputs is preserved, thereby preserving the economic neutrality of VAT (van Brederode, 2021). Exemptions and multiple rates, on the other hand, generate welfare costs. Exemptions (without credit) lead to tax cascading,[3] Vertical integration, self-supply bias, distortion of competition, discrimination against exports, and the creation of complexities for input VAT allocation. Zero rates (exemptions with credit) and reduced rates similarly lead to distortion of consumer and producer choices (Ebrill et al., 2001; de la Feria & Krever, 2013; Cnossen, 2022). The general conclusion is that exemptions (without credit) should be strictly limited to those necessary for administrative reasons, such as hard-to-tax sectors where revenue is based on margins, like the financial sector, and reduced rates should be avoided (Cnossen, 2022).

The driver for a multiple rate structure is to make the VAT system progressive. Exempting foods and a few meritorious services that have positive externalities (e.g., health and education) is common in many countries. A recent study finds that 54% of countries worldwide apply a multiple-rate structure, and 46% apply a single rate (van Brederode, 2021). In addition to the

[2] There exist four main reasons to justify a multiple rate structure for VAT: a) the need to provide preferential treatment for gaining societal support at the introduction of the tax; b) to support distributional equality by combating the (alleged) regressivity of VAT; c) to respond to externalities produced by some goods and services through Pigouvian taxes or subsidies; and d) to realise specific economic cyclical policy objectives.

[3] Cascading is the "tax on tax" effect when a tax is charged on an input and output. The base for the tax on the output includes the tax on the input. Consequently, as the number of production stages increases, the cascading impact becomes larger (Ebrill et al., 2001).

standard rate, 78 countries apply reduced rates, and 13 countries apply increased rates. Of the countries with increased rates, 9 combine the standard rate with reduced and increased rates, and four countries combine a standard rate with 1 or 2 increased rates and apply no reduced rates. Of the countries with reduced rates, 38 countries apply a single reduced rate, while 40 apply 2 or 3 reduced rates. A minority of countries, 70, apply only the standard rate. Among the reviewed jurisdictions, only five countries in the Asia/Pacific region apply reduced rates, 14 in Africa/Middle East, 15 in the Americas/Caribbean, and the remaining 43 are all in Europe. This paper aims to assess the distributional impact of Indian GST based on an extensive household consumption expenditure survey conducted by the NSSO in 2022-23.

The following section presents the sources of data and the data cleaning process. This is followed by the presentation of basic statistics in section three. The results and discussion are presented in section four. We summarise our findings and conclude our discussion in section five.

2. Sources of Data

2.1. Cleaning of Data

We observe that the average Monthly Per Capita Consumption Expenditure (MPCE) item-wise sum does not match all groups' sub-totals presented in the HCES 2022-23. To address this issue, we consider the item-wise sum of the average MPCE across 390 items as an alternative to the sub-totals.

The HCES 2022-23 covers 448 lines of items. Among these, 51 lines are sub-totals and totals. We have excluded seven items from the list for the average MPCE, as they are not subject to GST (Table 2). Therefore, we have 390 items of consumption for which the average MPCE across fractile classes of average MPCE is available for rural and urban areas at the all-India level.

Table 1: List of Items Covered in the NSSO's HCES 2022-23

Description	No. of Items
Total Number of Items listed in the NSSO's HCES 2022-23 (A)	448
Number of Items listed as Sub-total and Totals (B)	51
Number of Items (A-B)	397
Number of Items Excluded (C)*	7
Number of Items Considered for Average MPCE (D) (A-B-C)	390

Note: *-see table 2 for the list of items.
Source: Computed by the author based on HCES 2022-23.

Table 2: List of Items Not Attracting GST

Item Code	Item Description	Group
281	cooked meals received free in workplace	289 - served processed food: sub-total
282	cooked meals received as assistance	
401	books, journals, etc.: second hand	409-education: sub-total
539	house/garage rent (imputed)	
899	other consumer taxes & cesses	
375	clothing: second-hand	379-clothing: sub-total
395	footwear: second-hand	399-footwear: sub-total

Source: As in Table 1.

2.2 Assignment of GST Rates

The Indian GST rate structure has seven schedules for goods, apart from schedules for 'Nil rates' and 'GST Compensation Cess' for specific consumption items. Harmonised System Nomenclature (HSN) classifies commodity codes into four to eight-digit levels. Services are classified according to Service Accounting Codes (SAC). There are seven GST rates – Nil rate, 0.25%, 3%, 5%, 12%, 18%, and 28%. In addition, there are a few specific rates, for example, 1% (applicable to tax collection at source and composition taxpayers involved in manufacturing), 1.5% (relevant to the construction of affordable residential apartments, cutting and polishing diamond and diamond job works), 6% (applicable to brick kilns under composition scheme, without input tax credit [ITC], and composition taxpayers involved in providing services), and 7.5% (applicable to construction of residential apartments other than affordable residential apartments). Exports are zero-rated, and items falling under the 'Nil rate' cannot claim ITC against inputs and capital goods. The rationale behind this rate structure is to make the GST system progressive.

Assigning GST rates across 390 items of goods and services cannot be done without following a subjective approach. Price-based rate fixation and setting GST rates based on the marketing or physical features of commodities (e.g., packaging and labelling, or the composition of the product) make it challenging to assign specific GST rates across commodities (Mukherjee, 2024; Mukherjee, 2023). To overcome this challenge, we classify the GST rate structure into nine categories, viz., exempt, very low (exempt to 5%), low (5%), lower middle (5 to 12%), middle (12%), upper middle (12 to 18%), upper (18%), high (28%), and very high (>28%). Some selected items (e.g., tobacco and tobacco products, aerated waters, carbonated beverages, fruit drinks, and carbonated beverages with fruit juice, and certain motor vehicles) attract a GST rate of 28% along with a GST compensation cess, and we have classified them under a very high category. In addition, we classify the items which are not either under the GST (e.g., electricity, alcoholic beverages for human consumption) or the date of introduction of GST is yet to be recommended by the GST council (e.g., petrol/gasoline/motor spirit, diesel, natural gas) under 'Out of GST' category.

The distribution of items across GST rates is presented in Table 3. Among the 390 items, 154 are consumption items that are either exempt or attract a 5% GST. Of these 154 items, 105 (i.e., 68%) are food items, while the rest are non-food items. Seventy-four items attract a GST

rate of 5% to 12%; 35 are food items, and 39 are non-food items. One hundred thirty-six items attract a GST rate of 12% to 18%; 22 are food items, and the rest are non-food items. Three of the four items attracting a 28% GST are non-food items. Similarly, out of 10 items attracting a GST rate of more than 28%, nine are non-food items. This indicates that most items attracting GST rates of 12% or above are non-food items.

Table 3: GST Rate Category-wise Distribution of Items of Consumption available in the NSSO's HCES 2022-23

GST Rate Category	Total		Food		Non-Food	
	No. of Items	% Share	No. of Items	% Share	No. of Items	% Share
(i) Exempt	90	23.1	57	34.8	33	14.6
(ii) Very Low (Exempt to 5%)	64	16.4	48	29.3	16	7.1
(iii) Low (5%)	40	10.3	34	20.7	6	2.7
(iv) Lower Middle (5 to 12%)	34	8.7	1	0.6	33	14.6
(v) Middle (12%)	21	5.4	11	6.7	10	4.4
(vi) Upper Middle (12 to 18%)	28	7.2	2	1.2	26	11.5
(vii) Upper (18%)	87	22.3	9	5.5	78	34.5
(viii) High (28%)	4	1.0	1	0.6	3	1.3
(ix) Very High (>28%)	10	2.6	1	0.6	9	4.0
(x) Out of GST	12	3.1	0	0.0	12	5.3
Total	**390**	**100.0**	**164**	**100.0**	**226**	**100.0**

Source: As in Table 1.

3. Basic Statistics

3.1 Distribution of Consumption Expenditure across GST Rates

The distribution of average MPCE across GST rates shows that 45% of total expenditures fall under the exempted to very low (5%) GST rates category in rural and urban areas (Tables 4 and 5). A significant share of food spending, 64% in rural and 58% in urban areas, falls under this category. Of non-food expenditure, 30% in rural and 36% in urban areas fall under this category. One-fourth of total spending (26% on food and 24% on non-food) falls under the '5 to 12%' GST rate category in rural areas. In urban areas, 23% of total expenditure (28% on foods and 19% on non-foods) falls under the '5 to 12%' GST rate category. 18% of total spending (10% on food and 26% on non-food) in rural areas and 20% of total expenditure (13% on food and 24% on non-food) in urban areas attract GST rates from 12% to 18%. In both regions, only 1% of total expenditure attracts a GST rate of 28%. This is mainly on non-food spending. Only 2% of total outlays attract a GST rate higher than 28% across all regions. This is primarily on non-food expenditures. This shows that the distribution of consumption expenditure varies across regions (i.e., rural and urban areas). Therefore, the GST capacity will vary depending on the distribution of the total population between rural and urban areas in a state and their average consumption expenditure and consumption pattern. Apart from the average MPCE, the composition of average MPCE across GST rates is vital for the GST base. Therefore, depending on the composition of consumption expenditure across GST rates, GST capacity will vary across states.

Table 4: Distribution of Average MPCE across GST Rate Categories in Rural India

GST Rate Category	Rural					
	Total Expenditure		Expenditure on Food		Expenditure on Non-Food	
	Amount	% Share	Amount	% Share	Amount	% Share
Exempt to 5% (i+ii)	1,688.2	45.4	1,092.2	64.2	596.0	29.5
5% to 12% (iii+iv)	916.2	24.6	440.0	25.8	476.2	23.6
12% to 18% (v to vii)	683.9	18.4	163.8	9.6	520.2	25.8
28% (viii)	42.2	1.1	4.4	0.3	37.9	1.9
>28% (ix)	69.5	1.9	2.1	0.1	67.4	3.3
Out of GST	319.70	8.6	-	-	319.70	15.8
All	**3,719.71**	**100.0**	**1,702.48**	**100.0**	**2,017.23**	**100.0**

Source: As in Table 1.

Table 5: Distribution of Average MPCE across GST Rate Categories in Urban India

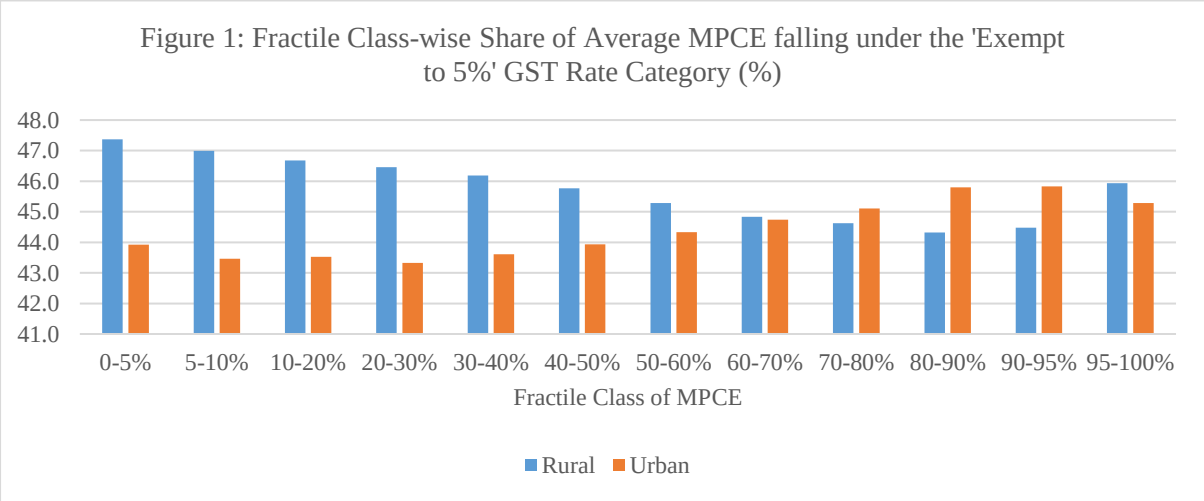
GST Rate Category	Urban					
	Total Expenditure		Expenditure on Food		Expenditure on Non-Food	
	Amount	% Share	Amount	% Share	Amount	% Share
Exempt to 5% (i+ii)	2,867.6	44.8	1,450.4	58.2	1,417.2	36.2
5% to 12% (iii+iv)	1,440.5	22.5	702.7	28.2	737.9	18.9
12% to 18% (v to vii)	1,265.3	19.8	328.1	13.2	937.2	24.0
28% (viii)	69.7	1.1	7.7	0.3	62.0	1.6
>28% (ix)	114.0	1.8	3.5	0.1	110.5	2.8
Out of GST	646.78	10.10	-	-	646.78	16.53
All	**6,403.98**	**100.00**	**2,492.33**	**100.00**	**3,911.65**	**100.00**

Source: As in Table 1.

Appendix Table A.1 presents the range of MPCE and the average MPCE of each fractile class. We performed data cleaning, as described above, and present the adjusted average MPCE for each fractile class.

Figure 1 shows that consumers from lower fractile classes in rural areas consume more items that fall under the 'exempt' and 'exempt to 5%' GST rate categories than higher fractile classes, except for the highest fractile class, i.e., '95 to 100%'. In contrast, consumers from higher fractile classes consume more items that fall under 'exempt' and 'exempt to 5%' GST rate categories in urban areas than consumers from lower fractile classes. This suggests that reducing the list of exempted items and/or increasing the GST rate on items that are either currently exempt or attract a 5% GST may increase the tax burden for lower-fractile classes in rural areas. With some exceptions, the impact of this policy decision will differ for urban areas. Therefore, any attempt to increase the GST base by shrinking the list of exempted goods may be weighed against the benefit of additional revenue generation from the rise in the GST base, versus the additional tax burden that rural consumers from lower fractile classes must bear.

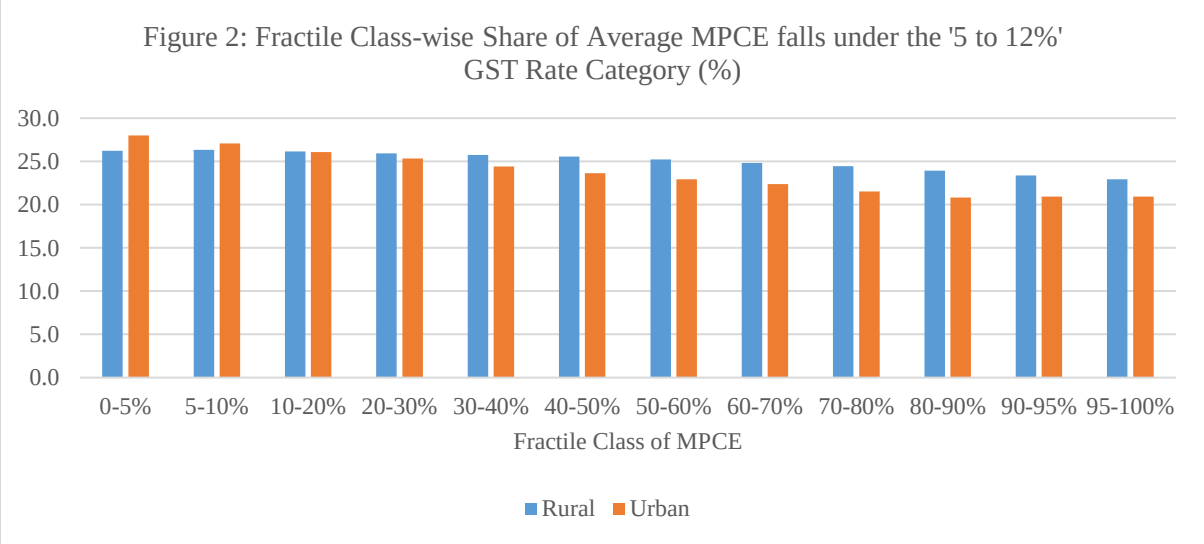
Figure 1: Fractile Class-wise Share of Average MPCE falling under the 'Exempt to 5%' GST Rate Category (%)



Source: As in Table 1.

In rural areas, the share of average MPCE on items falling under the '5 to 12%' GST rate categories is declining for higher fractile classes (Figure 2). A similar trend also holds for urban areas. This analysis shows that the share of average MPCE of consumers in the lower fractile classes is higher than that of the higher fractile classes on items falling under the '5 to 12%' GST rate category. Therefore, imposing a higher tax on these items may increase the tax burden on consumers from lower fractile classes across all regions.

Figure 2: Fractile Class-wise Share of Average MPCE falls under the '5 to 12%' GST Rate Category (%)

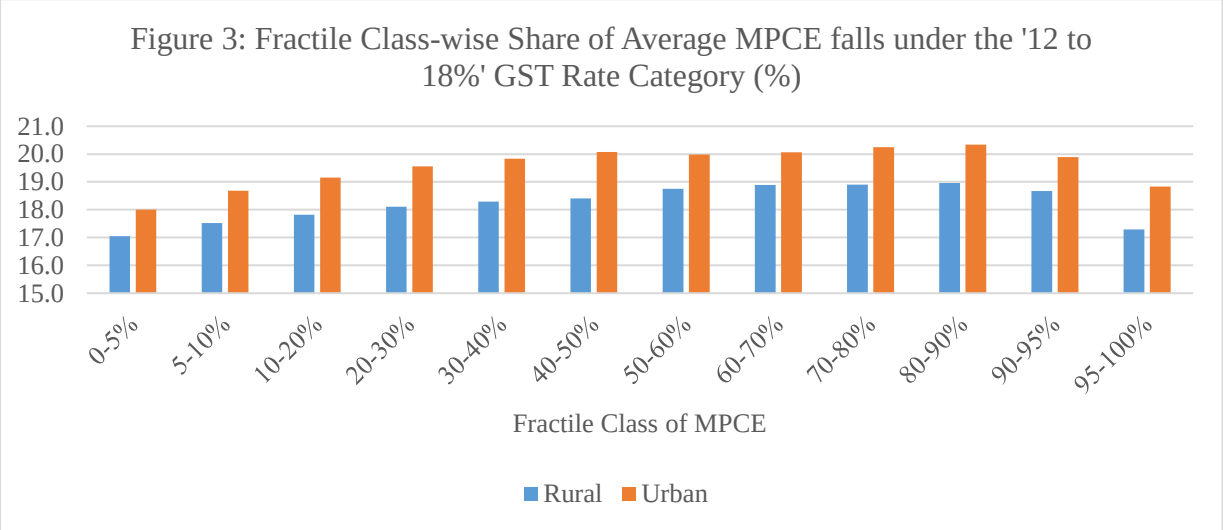


Source: As in Table 1.

In rural areas, the share of average MPCE on items falling under the '12 to 18%' GST rate category increases with the fractile classes up to 80-90%; thereafter, it falls (Figure 3). In urban

areas, the share of average MPCE on these items increases with the fractile classes up to 40-50%; thereafter, it moderately declines up to the fractile class 60-70%. It increases again up to the fractile class 80-90%. Thereafter, it falls into two consecutive fractile classes. Therefore, except for the top two fractile classes, the '12 to 18%' GST rate category is progressive for rural areas. For urban areas, it is progressive up to the fractile class '40-50%'; thereafter, it is proportionate until the fractile class '80-90%'; thereafter, it is regressive. Increasing the GST rates on these items may not be regressive if designed carefully.

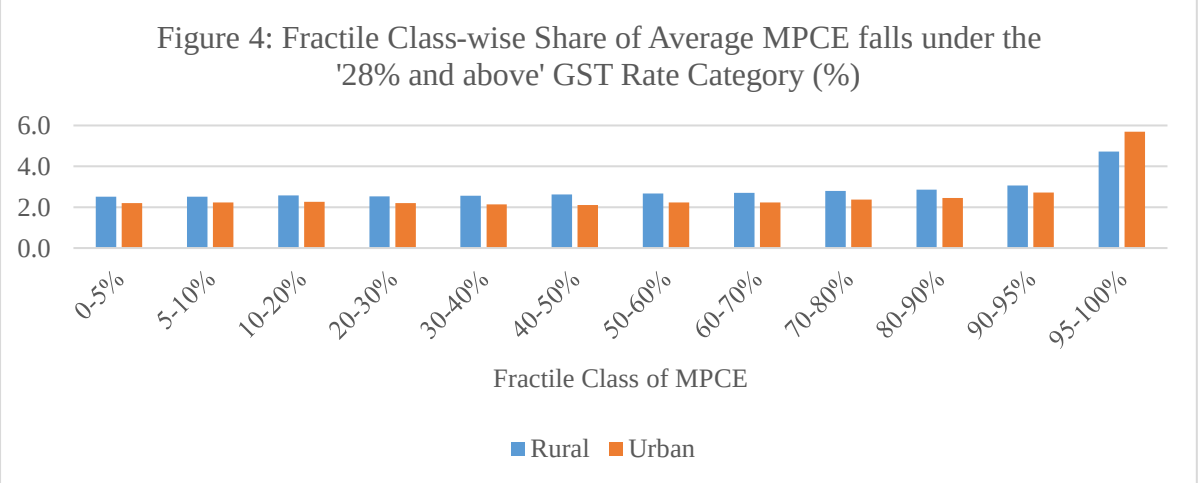
Figure 3: Fractile Class-wise Share of Average MPCE falls under the '12 to 18%' GST Rate Category (%)



Source: As in Table 1.

In rural and urban areas, the share of the average MPCE on items falling under the '28% and above' GST rate category is higher for consumers in the higher fractile classes (Figure 4). This shows that imposing a higher tax on these items may not be regressive.

Figure 4: Fractile Class-wise Share of Average MPCE falls under the '28% and above' GST Rate Category (%)



Source: As in Table 1.

3.2 Distribution of Consumption Expenditure on Food and Non-Food

Table 6 presents the distribution of average MPCE across fractile classes for rural and urban areas. We observe that in rural areas, the average share of expenditure on food is seven percentage points higher than in urban areas, and the share of expenditure on non-food is higher in urban areas than in rural areas. In non-food, the share of consumables is higher in urban areas, whereas the share of durables is higher in rural areas. The share of average MPCE on food is higher for the bottom 50% of consumers (Fractile class up to '40-50%') compared to the top 5% of consumers (Fractile class '95-100%'). Conversely, the share of non-food consumption is higher for the top 5% of consumers compared to the bottom 50% of consumers. Exempting and placing food items under the lower GST rate categories may be justified, as it helps people from lower-fractile classes to sustain their consumption.

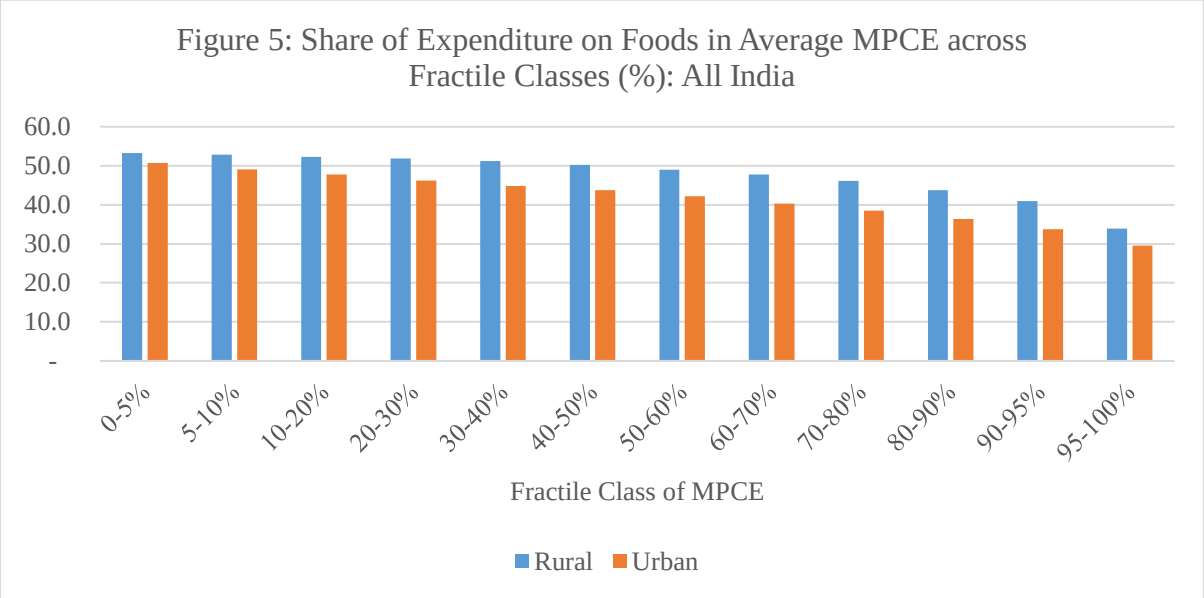
Table 6: Fractile Class-wise Share of Average MPCE on Food and Non-Food for Rural and Urban Areas (%)

Fractile Class of MPCE	Rural				Urban			
	Food (A)	Consumables (B)	Durables (C)	Non-Food (B+C)	Food (A)	Consumables (B)	Durables (C)	Non-Food (B+C)
0-5%	53.2	35.4	11.4	46.8	50.7	38.8	10.5	49.3
5-10%	52.8	35.8	11.4	47.2	49.1	40.5	10.5	50.9
10-20%	52.3	36.2	11.5	47.7	47.8	41.6	10.6	52.2
20-30%	51.8	36.6	11.6	48.2	46.2	43.1	10.7	53.8
30-40%	51.2	37.2	11.6	48.8	44.8	44.2	11.0	55.2
40-50%	50.2	38.0	11.8	49.8	43.8	45.1	11.1	56.2
50-60%	49.0	39.1	11.9	51.0	42.2	46.5	11.3	57.8
60-70%	47.8	40.0	12.2	52.2	40.3	48.0	11.7	59.7
70-80%	46.1	41.3	12.5	53.9	38.5	49.3	12.2	61.5
80-90%	43.7	43.2	13.1	56.3	36.3	50.8	12.8	63.7
90-95%	41.0	45.0	14.1	59.0	33.7	52.5	13.8	66.3
95-100%	33.9	47.7	18.4	66.1	29.6	53.5	17.0	70.4
All	**45.8**	**41.1**	**13.2**	**54.2**	**38.9**	**48.4**	**12.7**	**61.1**
Average share of consumption expenditure of the top 5% of consumers (fractile class 95-100%) / Average share of consumption expenditure of the bottom 50% of consumers (fractile class up to 40-50%)	0.65	1.31	1.59	1.37	0.63	1.27	1.58	1.33

Source: As in Table 1.

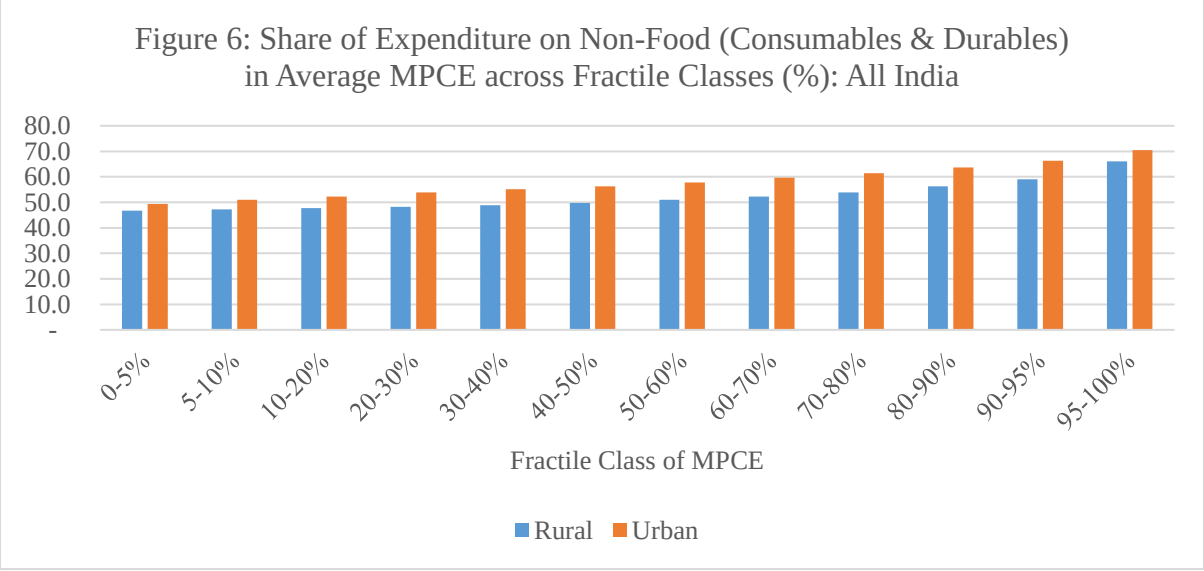
We observe that the share of average MPCE on food decreases with higher fractile classes, further supporting the argument that exemptions and lower GST rates on food are contributing to the progressive nature of the Indian GST (Figure 5). Conversely, the share of expenditure on non-food items increases with higher fractile classes, which supports the argument that higher GST rates on non-food items may help make the GST more progressive (Figure 6).

Figure 5: Share of Expenditure on Foods in Average MPCE across Fractile Classes (%): All India



Source: As in Table 1.

Figure 6: Share of Expenditure on Non-Food (Consumables & Durables) in Average MPCE across Fractile Classes (%): All India



Source: As in Table 1.

4. Results and Discussion

In this section, we assess the overall progressivity or regressivity of Indian GST based on two scenarios (Table 7). In scenario I, we assume that items (or groups of items) falling under any tax category attract a lower bound tax rate of that tax category. This gives us a lower bound estimate of the tax burden borne by consumers. In scenario II, we assume that items of

consumption falling under any tax category attract the upper bound tax rate of that tax category. This gives us the upper-bound estimate of the tax burden that consumers bear. As discussed earlier, assigning specific tax rates across consumption items is difficult given the complexities of the present GST rate structure. For our analysis, we exclude items falling into the 'Out of the GST' tax category. Including items that do not attract GST may give us a distorted picture of consumers' tax burden under the GST. We also exclude the average MPCE corresponding to 'Out of GST' items from the overall average MPCE of each fractile class of MPCE. It is also worth highlighting that the average MPCE depicts the market value of the consumption basket, and therefore includes the GST burden. We estimate the tax burden (average tax liability) using the following methodology:

Market Value of Consumption (P_m*Q) = P_p*(1+t)*Q
Tax Liability = P_p*Q*t = (P_m*Q*t)/(1+t) (1)
Tax Liability as % of Adjusted Average MPCE = Tax Liability / Average MPCE excluding Average MPCE on 'Out of GST' items

Where,

P_m is the market price of goods and services
P_p is the producer's price of goods and services
t is the tax rate
Q is the quantity of consumption

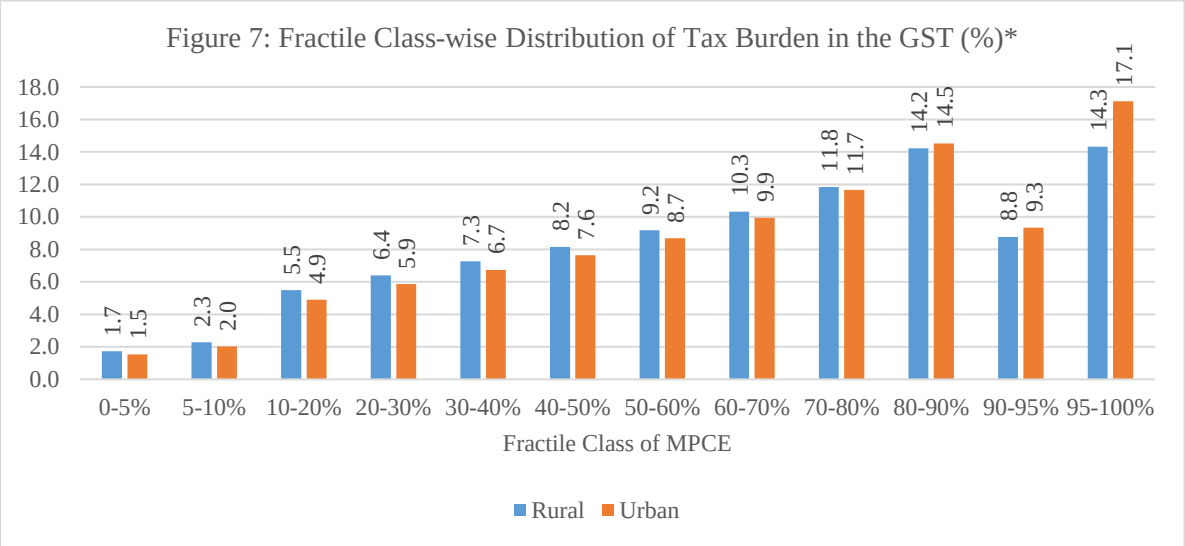
Table 7: GST Rates across Scenarios

Tax category	Scenario I (Tax Rate)	Scenario II (Tax Rate)
Exempt	Exempt	Exempt
Very Low (exempt to 5%)	Exempt	5%
Low (5%)	5%	5%
Lower Middle (5 to 12%)	5%	12%
Middle (12%)	12%	12%
Upper Middle (12 to 18%)	12%	18%
Upper (18%)	18%	18%
High (28%)	28%	28%
Very High (>28%)	28.5%	30%*

Note: *-This consists of GST Compensation Cess, and a rate higher than 28% results in an analysis similar to the one presented here.
Source: Computed by the author

We estimate GST liabilities of consumers across fractile classes based on the average MPCE and scenarios presented above. The bottom 50% and the middle 30% of consumers bear 31% each, while the top 20% bear 37% of the tax burden in rural areas. In urban areas, the bottom 50% of consumers bear 29%, the middle 30% bear 30%, and the top 20% bear 41% of the tax burden (Figure 7).

Figure 7: Fractile Class-wise Distribution of Tax Burden in the GST (%)*



Note: *-This is average across scenarios.
Source: Computed by the author

The average MPCE across fractile classes, after adjustments and deductions for consumptions of 'Out of GST' items, is termed the pre-GST average MPCE. The average GST liability (or average tax rate, ATR) of the ith fractile class in the jth region (rural or urban) is estimated as follows:

$$Average\ Tax\ Rate_{ij} = \frac{GST\ Liability_{ij}}{Pre{-}GST\ Average\ MPCE_{ij}} * 100 \qquad (2)$$

This analysis is based on three vital assumptions. First, we assume that consumers purchase all taxable goods and services from GST-registered entities. Second, taxpayers pass through (shift) the entire tax burden (or tax liability) to consumers. Therefore, there will be no difference between statutory and effective GST rates. Third, there is no cascading of taxes in the system. Estimating the cascading of taxes in the GST regime is beyond the scope of the present paper.[4] Without an estimate of the cascading impact of taxes, this paper captures only the direct effect of GST. However, the methodology developed by Mukherjee and Rao (2015) could help estimate the total (direct and cascading) incidence of GST if the appropriate data is available.
We observe that ATR for rural areas is either lower or similar to that of urban areas across all fractile classes of MPCE (Table 8 and Figure 8). This indicates that, depending on the consumption basket of goods and services, consumers in rural areas generally face a lower ATR than those in urban areas. The ATR on food is lower than that on non-food across all regions, fractile classes of MPCE, and scenarios. Given our earlier discussion, this helps to make the Indian GST system progressive.

[4] Cascading of taxes in the GST regime arises due to keeping primary energy sources (petrol, diesel, aviation turbine fuel [ATF], natural gas, crude petroleum, and electricity) out of the preview of the GST either for the time being or permanently, exemption of a selected list of goods and services from the GST, and annual turnover-based thresholds for GST registration. In the cascading of taxes, the producer's price with cascading will be greater than the producer's price without cascading. Therefore, given Q and t in equation 1, tax liability will be higher for consumers under tax cascading than without.

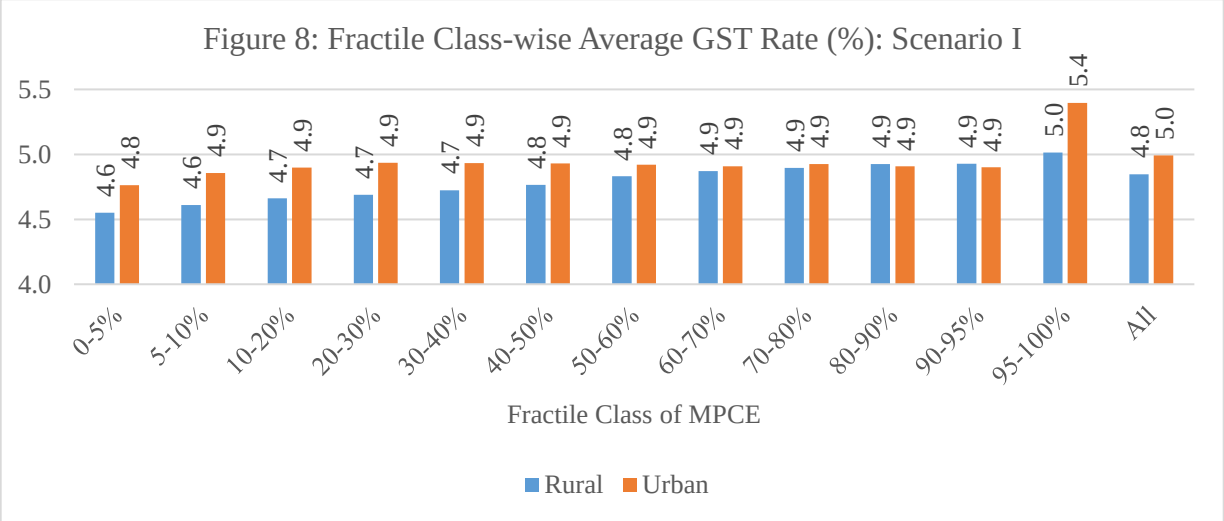
Table 8: Fractile Class-wise Average GST Liability on Food and Non-Food (%)

Fractile Class of MPCE	Food						Non-Food					
	Rural			Urban			Rural			Urban		
	Average MPCE (Rs.)	Scenario I	Scenario II	Average MPCE	Scenario I	Scenario II	Average MPCE (Rs.)*	Scenario I	Scenario II	Average MPCE*	Scenario I	Scenario II
0-5%	714	2.2	3.9	1,001	2.4	4.1	535	7.6	9.6	819	7.7	13.0
5-10%	922	2.3	4.1	1,264	2.5	4.2	708	7.6	9.6	1,093	7.6	12.9
10-20%	1,083	2.3	4.1	1,490	2.6	4.3	849	7.6	9.6	1,349	7.5	12.6
20-30%	1,249	2.4	4.2	1,720	2.7	4.5	993	7.6	9.6	1,648	7.3	12.3
30-40%	1,395	2.4	4.2	1,931	2.7	4.5	1,133	7.6	9.6	1,946	7.1	12.0
40-50%	1,530	2.4	4.2	2,155	2.9	4.6	1,284	7.5	9.6	2,263	6.9	11.7
50-60%	1,667	2.5	4.3	2,373	2.9	4.7	1,462	7.5	9.5	2,659	6.7	11.4
60-70%	1,830	2.6	4.4	2,609	3.0	4.7	1,664	7.4	9.4	3,179	6.5	11.0
70-80%	2,028	2.6	4.4	2,930	3.1	4.8	1,961	7.3	9.3	3,858	6.3	10.7
80-90%	2,314	2.7	4.4	3,456	3.3	4.9	2,452	7.0	9.1	5,050	6.0	10.3
90-95%	2,688	2.8	4.5	4,152	3.6	5.1	3,187	6.7	8.8	6,846	5.7	10.0
95-100%	3,525	3.1	4.6	6,100	4.1	5.3	5,921	6.2	8.3	12,630	6.0	10.6
All	1,702	**2.6**	**4.3**	2,492	**3.1**	**4.8**	1,698	**7.1**	**9.2**	3,265	**6.4**	**11.0**

Note: *-This excludes the average MPCE on 'Out of GST' items.
Source: Computed by the author

We observe that the average tax rate (ATR) either increases or remains unchanged for higher fractile classes in rural areas (Figure 8). Overall, the ATR increases for higher fractile classes in rural areas. In urban areas, the ATR increases between P_5 and P_{10}, remains unchanged for the fractile classes P_{10} to P_{95}, and increases for P_{100}.[5] A preliminary assessment indicates that the distributional impact of GST is moderately progressive or proportional.

Figure 8: Fractile Class-wise Average GST Rate (%): Scenario I

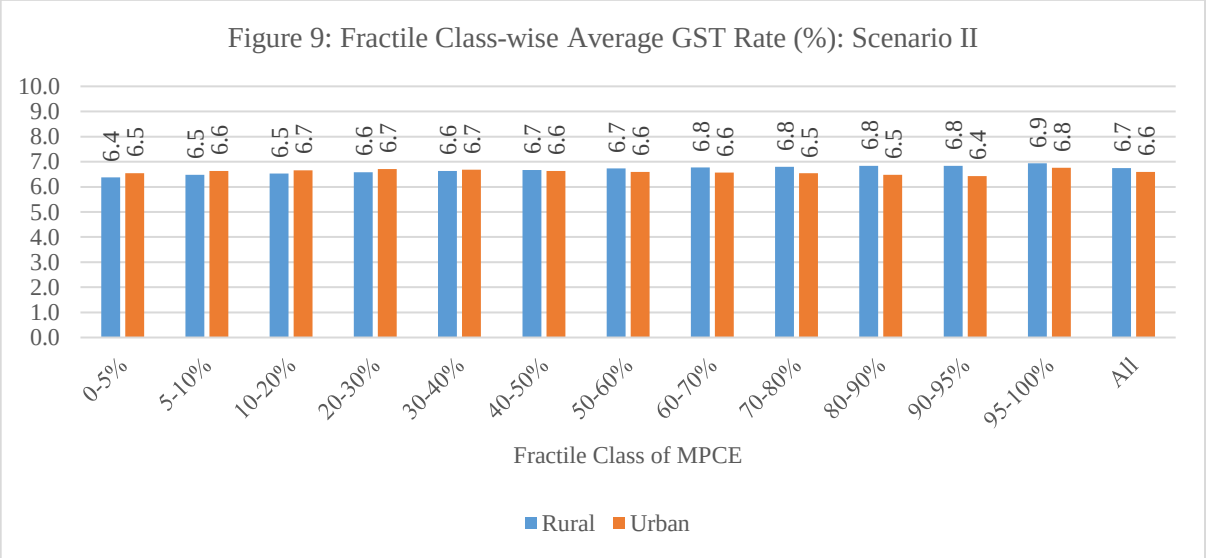


Source: Computed by the author

In Scenario II, a broad trend is observed, with a rising ATR and higher orders of fractile classes in rural areas (Figure 9). In urban areas, ATR increases up to the fractile class P_{30}; thereafter, it remains unchanged until the fractile class P_{70}. It decreases up to the fractile class P_{95}, and increases for the fractile class P_{100}. The ATR is progressive for the fractile classes up to P_{30}; thereafter, it is proportional until the fractile class P_{70}. Thereafter, it is regressive up to the fractile class P_{95}. The higher ATR is borne by the fractile class P_{100} across all regions.

[5] P_k (for k = 10, 20, 30, …, 80, 90,100) is the kth percentile of the distribution of persons by average MPCE, that is, the average MPCE level below which k% of the population lie.

Figure 9: Fractile Class-wise Average GST Rate (%): Scenario II



Source: Computed by the author

We employ various measures of tax progressivity to evaluate the Indian GST system. Following Fernandez (2024), we estimate the Progressive Vertical Index (PVI) of tax progressivity. The method of estimation of PVI is explained as follows:[6]

$$Progressive\ Vertical\ Index\ (PVI) = \frac{\text{Average tax rate paid by the top 5\% of the consumers}}{\text{Average tax rate paid by the bottom 50\% of the consumers}} \quad (3)$$

PVI	> 1	Vertical Progressivity
	$= 1$	Vertical Proportionate
	< 1	Vertical Regressivity

According to PVI, Indian GST is vertically progressive for rural and urban areas (Table 9). For non-food items, it is vertically regressive, whereas for food items, it is vertically progressive. Therefore, rationalising the GST rate structure may focus on adjusting rates for the non-food consumption basket to make the GST system more progressive.

[6] Fernandez (2024) considers the average tax rate paid by the top 1% of consumers; however, the NSSO's HCES 2022-23 presents data for the top 5% of consumers.

Table 9: Progressive Vertical Index of Indian GST

Region	Consumption of	Scenario I			Scenario II		
		Average Tax Rate of Top 5% Consumers	Average Tax Rate of Bottom 50% Consumers	PVI	Average Tax Rate of Top 5% Consumers	Average Tax Rate of Bottom 50% Consumers	PVI
Rural	Food	3.06	2.35	1.30	4.62	4.12	1.12
	Non-Food	6.18	7.60	0.81	8.31	9.62	0.86
	Total	5.01	4.67	1.07	6.93	6.55	1.06
Urban	Food	4.11	2.61	1.57	5.32	4.37	1.22
	Non-Food	6.01	7.35	0.82	10.62	12.40	0.86
	Total	5.40	4.89	1.10	6.76	6.64	1.02

Source: Computed by the author

As discussed earlier, the average MPCE represents consumption expenditure in market prices, which includes indirect taxes. We estimate the GST liability for each fractile class of MPCE and calculate the post-tax MPCE. The post-tax MPCE is like disposable income after income tax, as studies based on the income-based approach consider it. Consequently, we estimate the Gini coefficient of consumption expenditure for both the average MPCE at market prices and the post-tax MPCE.

Post-tax consumption inequality declines for scenario I across all regions (Table 10). In scenario II, post-tax consumption inequality declines for rural areas, whereas it increases marginally in urban areas.

Table 10: Fractile Class-wise Average MPCE (in Rs.)

Fractile Classes of MPCE	Average MPCE: Reported		Average MPCE: Adjusted*		Average MPCE: Pre-GST**		Average MPCE: Post-GST (Scenario-I)#		Average MPCE: Post-GST (Scenario-II)#	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
0-5%	1,373	2,001	1,341	1,975	1,249	1,820	1,192	1,734	1,169	1,701
5-10%	1,782	2,607	1,745	2,578	1,630	2,357	1,554	2,243	1,524	2,201
10-20%	2,112	3,157	2,073	3,120	1,932	2,839	1,842	2,700	1,806	2,650
20-30%	2,454	3,762	2,411	3,725	2,243	3,368	2,138	3,201	2,095	3,142
30-40%	2,768	4,348	2,724	4,308	2,528	3,877	2,408	3,686	2,360	3,618
40-50%	3,094	4,963	3,047	4,924	2,814	4,419	2,680	4,201	2,626	4,126
50-60%	3,455	5,662	3,403	5,625	3,129	5,032	2,978	4,785	2,918	4,700
60-70%	3,887	6,524	3,829	6,472	3,494	5,788	3,324	5,504	3,258	5,408
70-80%	4,458	7,673	4,395	7,604	3,989	6,788	3,794	6,454	3,718	6,344
80-90%	5,356	9,582	5,293	9,513	4,766	8,505	4,532	8,088	4,441	7,955
90-95%	6,638	12,399	6,558	12,304	5,875	10,998	5,586	10,459	5,474	10,291
95-100%	10,501	20,824	10,393	20,637	9,446	18,731	8,972	17,720	8,791	17,464
All Classes	3,773	6,459	3,720	6,404	3,400	5,757	3,235	5,470	3,171	5,377
Gini coefficient of consumption expenditure	0.2662	0.3140	0.2677	0.3144	0.2611	0.3129	0.2604	0.3124	0.2604	0.3131

Notes: *-This represents the item-wise sum of the average MPCE of consumer groups, distributed across fractile classes of MPCE, after excluding the consumption of items not subject to GST (see footnote 1).
**-This is the item-wise sum of the average MPCE (adjusted) of consumer groups distributed across fractile classes of MPCE after excluding consumption of 'Out of GST' items.
#-This is the net of tax liability of pre-GST average MPCE.
Source: Compiled and computed by the author based on HCES 2022-23 data.

We estimate the Kakwani tax progressivity index, which measures a tax structure's progressivity by considering the average tax rates of different population fractiles. The formula for calculating the Kakwani index (KI) is as follows:

$$KI = (CIT - G_{pre}) \quad (6)$$

G_{pre} is the pre-tax Gini coefficient of consumption expenditure, and CIT is the concentration index of the distribution of tax burden across different consumer groups, ranked according to pre-tax average MPCE.

The tax system is progressive if the value of KI is positive. It is regressive if KI is negative and proportional if KI is zero.

The concentration index (CI) is computed by using the following formula:

$$CI = (p_1 L_2 - p_2 L_1) + (p_2 L_3 - p_3 L_2) + \cdots + (p_{T-1} L_T - p_T L_{T-1}) \quad (7)$$

Where p is the cumulative share (per cent) of the population ranked by average MPCE, L(p) is the corresponding concentration curve of tax burden, and T is the number of consumer groups.

Indian GST has a low progressive effect, as the KI values are small and positive (Table 11).

A related indicator commonly used and close to that initially proposed by Musgrave and Thin (1948) is the Reynolds-Smolensky (1977) index, which measures the overall redistributive effect of a tax. For the Indian GST, the difference between the Gini coefficient for (equivalised) pre-tax consumption and the concentration coefficient of post-GST consumption across consumer groups is calculated and ranked by pre-tax average MPCE. As such, the Reynolds-Smolensky Index (RSI) measures how much closer to equality is post-tax consumption than pre-tax consumption (without changing the ranking of individuals) – i.e., the reduction in inequality due to the tax. It can be expressed as follows:

$$RSI = G_{pre} - CIC_{post} = \frac{t}{(1-t)}\left(CIT - G_{pre}\right) = \frac{t}{(1-t)} KI \quad (8)$$

Where G_{pre} is the pre-tax Gini coefficient of consumption expenditure, CIC_{post} is the post-tax concentration index of consumption, t is the aggregate average tax rate (in per cent), CIT is the concentration index of the distribution of tax burden across different consumer groups (ranked according to pre-tax average MPCE), and KI is the Kakwani Index of Progressivity. This relationship highlights that redistribution can be achieved even by a tax system with only a small degree of progressivity if the average tax is high. Equally, a tax system with low tax rates requires a highly progressive system to achieve the same degree of redistribution.

Musgrave and Thin (1948) compared the inequality between before-tax and after-tax income distribution. A progressive tax system is associated with a decrease in income inequality, while an increase in income inequality will reflect regressive tax rates. The tax system is considered proportional when the before-tax and after-tax income inequalities are identical.

We also estimate the Musgrave-Thin Index (MTI), which is the difference between the Gini coefficient on pre-tax consumption and the Gini coefficient on after-tax consumption. The MTI can be expressed as MTI= G_{pre}-G_{post}, where G_{post} is the post-tax Gini coefficient of consumption expenditure across consumer groups, ranked according to pre-tax average MPCE. The results show that the Indian GST system is moderately progressive or proportional (Table 11). It also shows that the redistributive effect of the GST is positive, as post-tax consumption inequality falls.

Table 11: Assessment of Progressivity of Indian GST

Indicator / Index	Rural		Urban	
	Scenario I	Scenario II	Scenario I	Scenario II
Gini Coefficient of Consumption Expenditure (G_{pre})	0.261118		0.312938	
Concentration Index of Tax Burden (CIT)	0.27456	0.27168	0.32333	0.31103
Kakwani Index of Progressivity (KI)	0.01345	0.01057	0.01040	-0.00191
Concentration Index of Consumption (CIC_{post})	0.26043	0.26035	0.31239	0.31307
Average Tax Rate (in per cent)	0.04846	0.06749	0.04991	0.06598
t/(1-t)	0.05093	0.07238	0.05253	0.07064
[t/(1-t)]*KI	0.00068	0.00076	0.00055	-0.00014
Reynolds-Smolensky Index (RSI)	0.00068	0.00076	0.00055	-0.00014
Gini Coefficient of Consumption Expenditure (G_{post})	0.26043	0.26035	0.31239	0.31307
Musgrave-Thin Index (MTI)	0.00068	0.00076	0.00055	-0.00014

Source: Computed by the author

5. Conclusions

Taxes on commodities and services account for more than three-fifths (62.3%) of India's general government's total tax collection. Consequently, a larger share of the tax burden is borne by consumption taxes than taxes on income, property, capital, and other transactions. The GST contributes half of the total tax collection from commodities and services; therefore, it is essential to assess the distributional impact of GST across consumer groups. The literature on the distributive impact of taxes in India is sparse, and the harmonisation of the tax structure in the GST regime has made it possible to assign tax rates across consumption items.

Based on the NSSO's HCES 2022-23, we assess the distributional impact of Indian GST separately for rural and urban areas across fractile classes of average MPCE. The

survey covers 2,61,746 households (59% rural and 41% urban) and 390 consumption items. The average MPCE across 390 items, by fractile class of average MPCE, is available for rural and urban areas at the all-India level. However, this survey does not capture the income of the households, which restricts our ability to assess the distributional impact of the GST using an income-based approach.

The results show that the Indian GST is progressive according to various measures of progressivity, including the Progressive Vertical Index, Kakwani Index of Progressivity, Reynolds-Smolensky Index, and Musgrave-Thin Index. The bottom 50% and the middle 30% of consumers bear 31% each, while the top 20% bear 37% of the tax burden in rural areas. In urban areas, the bottom 50% of consumers bear 29%, the middle 30% bear 30%, and the top 20% bear 41% of the tax burden. Any GST rate structure changes may have distributional implications depending on the consumption patterns of consumers across different GST rate categories. The redistributive effect of Indian GST is positive, as post-tax consumption inequality decreases.

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Appendix

Table A.1: Fractile Classes of Average MPCE for 2022-23 (in Rs.)

Fractile Class of MPCE	Rural				Urban			
	Lower Limit (Rs.)	Upper Limit (Rs.)	Average MPCE (Rs.)- Reported	Average MPCE (Rs.): Adjusted	Lower Limit (Rs.)	Upper Limit (Rs.)	Average MPCE (Rs.)- Reported	Average MPCE (Rs.): Adjusted
0-5%	≤1,638		1,373	1,341	≤2,382		2,001	1,975
5-10%	1,638	1,912	1,782	1,745	2,382	2,813	2,607	2,578
10-20%	1,912	2,289	2,112	2,073	2,813	3,467	3,157	3,120
20-30%	2,289	2,612	2,454	2,411	3,467	4,043	3,762	3,725
30-40%	2,612	2,927	2,768	2,724	4,043	4,647	4,348	4,308
40-50%	2,927	3,268	3,094	3,047	4,647	5,286	4,963	4,924
50-60%	3,268	3,657	3,455	3,403	5,286	6,061	5,662	5,625
60-70%	3,657	4,138	3,887	3,829	6,061	7,036	6,524	6,472
70-80%	4,138	4,819	4,458	4,395	7,036	8,425	7,673	7,604
80-90%	4,819	6,043	5,356	5,293	8,425	11,089	9,582	9,513
90-95%	6,043	7,411	6,638	6,558	11,089	14,189	12,399	12,304
95-100%		>7,411	10,501	10,393		>14,189	20,824	20,637
All Classes			3,773	3,720			6,459	6,404

Source: Computed and compiled from HCES 2022-23 data.

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